

## Hepatobiliary Tract

### Liver Trauma

- Diagnosis
  - Computed tomography (CT) scan with oral and IV contrast
  - Focused assessment with sonography for trauma (FAST) examination
  - Diagnostic peritoneal lavage
- Treatment
  - As in adult patients, the primary goal of emergent operative therapy for liver injury should be to stop the bleeding and “get out” before the patient becomes coagulopathic, and return to the operating room in 24–48 hours when a definitive repair can be performed on a patient who is more physiologically stable
  - If the patient is hemodynamically stable, perform a serial physical examination and check hematocrit levels in the setting of an intensive care unit, using typed and cross-matched blood, if needed
  - Perform laparotomy if the patient is actively bleeding, or if blood loss is > 50% of blood volume (40 cc/kg packed red blood cells), or if > 12 cc/kg of Ringer’s lactate (warmed if possible) is required to maintain hemodynamic stability
    - ▶ Pack initially with gauze sponges
    - ▶ Use compression to control venous bleeding
    - ▶ Perform resectional debridement of devitalized tissue using “finger fracture” technique, with direct suture ligation of bleeding vessels
    - ▶ Clamp the hepatoduodenal ligament, which contains the hepatic artery, portal vein, and common bile duct, (Pringle Maneuver) to help control bleeding
    - ▶ Parenchymal bleeding may be controlled with chromic sutures swedged on blunt liver needles and placed over omental pledgets
    - ▶ If the patient is unstable or has extensive hepatic bleed-

ing, pack with gauze sponges and hemostatic agents, apply a vacuum device to the abdomen, and reexplore in 24 hours; this will help prevent the factors exacerbating a coagulopathic state (hypothermia, acidosis, and hypotension)

- Hemobilia
  - Etiology: usually a sequella of hepatobiliary tract trauma
  - Symptoms include a triad of right upper quadrant pain, bleeding from the upper gastrointestinal tract, and jaundice
  - Diagnosis is made with CT scan or angiography
  - Treat with embolization instead of surgical exploration, if possible

## **Biliary Tract**

- Trauma
  - Traumatic injuries to the gallbladder should be treated by cholecystectomy
  - Injury to the common bile duct should be repaired over a T-tube
  - Following extensive injury to the extrahepatic biliary tract, perform one of the following:
    - ▶ Damage control: tube choledochostomy
    - ▶ Definitive repair: choledochostomy or hepatojejunostomy
- Biliary atresia
  - A dynamic process of progressive obliteration and sclerosis due to a postnatal inflammatory process
  - Correctable: proximal extrahepatic bile ducts are patent; distal ducts are obliterated
  - Uncorrectable: gallbladder, cystic duct, and common bile duct are patent; proximal hepatic ducts are obliterated
  - Laboratory tests: direct (conjugated) hyperbilirubinemia ( $> 3 \text{ mg/dL}$ ; for patients  $\geq 2 \text{ wk}$  old); biliary atresia is the most common cause of conjugated hyperbilirubinemia in a 1-month-old
  - Physical examination
    - ▶ Icteric (jaundice or bilirubin  $> 10$  at 7 days of life is pathologic)
    - ▶ Light (acholic), gray-colored stools
    - ▶ Dark urine

- ▶ Hepatomegaly
- Diagnosis
  - ▶ Liver biopsy
  - ▶ Technetium-99m
  - ▶ Iminodiacetate (diisopropyl iminodiacetic acid) scan
- Patient should be referred to a pediatric center for further work-up and operative treatment as soon as feasible
- Biliary hypoplasia
  - Not a specific disease entity, but a manifestation of a variety of hepatobiliary disorders including:
    - ▶ Neonatal hepatitis
    - ▶  $\alpha_1$ -Antitrypsin deficiency
    - ▶ Early intrahepatic biliary atresia
    - ▶ Alagille's syndrome (arteriohepatic dysplasia)
  - Treatment
    - ▶ Cannot be improved by operation
    - ▶ Perform a liver biopsy and close the abdomen without further treatment
    - ▶ Medications: choleretics (eg, ursodeoxycholic acid)
- Inspissated bile syndrome
  - Etiology
    - ▶ Massive hemolysis due to Rhesus factor and ABO incompatibility (resulting in obstruction from sludge in the biliary system)
    - ▶ Total parenteral nutrition cholestasis
    - ▶ Cystic fibrosis
  - Medications: choleretic agents (eg, phenobarbital, ursodeoxycholic acid, glucagon)
  - Treating an obstruction: remove stones and irrigate biliary tree via a catheter in the gallbladder
- Biliary ascites
  - Etiology: perforation of extrahepatic bile duct
  - Diagnosis: hepatobiliary iminodiacetic acid scan
  - Treatment: cholecystostomy, drainage
- Gallbladder disease
  - Hydrops
    - ▶ Pathology: severe edema around the gallbladder and common bile duct
    - ▶ Etiology: sepsis, scarlet fever, Kawasaki disease

- ▶ Diagnosis: ultrasound
- ▶ Treatment: usually resolves spontaneously
- Acalculous cholecystitis
  - ▶ Associated with sepsis, multisystem trauma, burns, total parenteral nutrition, and Kawasaki disease
  - ▶ Acute symptoms: fever, right upper quadrant tenderness, guarding, increased temperature, increased white blood cell count
  - ▶ Diagnosis: ultrasound showing gallbladder distention and echogenic debris
  - ▶ Treatment: may require cholecystectomy if severe
- Hemolytic cholelithiasis
  - Etiology
    - ▶ Hereditary spherocytosis (most common)
    - ▶ Sickle cell anemia
    - ▶ Thalassemia major
    - ▶ Hemolytic anemia
  - Treatment
    - ▶ Preoperative partial exchange or 2–3 transfusions preoperatively to decrease hemoglobin S to < 30%, and increase hemoglobin to 12 g/dL; intraoperatively, avoid hypothermia, acidosis, hypovolemia
    - ▶ Cholecystectomy is indicated in all patients with thalassemia major and spherocytosis who have symptomatic gallstones and in asymptomatic patients with gallstones who are undergoing splenectomy
- Choledocholithiasis
  - Commonly associated with sickle cell disease
  - Increased direct (conjugated) bilirubin, abdominal pain, fever, nausea
  - If amylase is also increased, consider choledocholithiasis with pancreatitis
  - Treatment
    - ▶ Endoscopic retrograde cholangiopancreatography (ERCP) and sphincterotomy preoperatively
    - ▶ Open or laparoscopic exploration